

REMARKS

By the above amendment, the claims have been amended to clarify features of the present invention in light of the rejection under 35 USC 112, first and second paragraphs, as will be discussed below. Additionally, independent claims 24 and 30 have been amended to incorporate features of dependent claims therein such that applicants submit that this amendment after final action does not raise new issues requiring further search and/or consideration.

Turning first to the rejection of claims 26 and 29 under 35 USC 112, second paragraph, applicants note that by the present amendment, as suggested by the Examiner, such claims have been amended to recite that the plate is made of silicon or carbon.

As to the rejection of claims under 35 USC 112, first paragraph and second paragraph, with regard to the spacing of the transmitter from the back surface of the plate, by the present amendment, independent claims 24 and 30 have been amended to adopt the language previously presented in the claims, which the Examiner in the office action dated June 27, 2006 considered to be indefinite under 35 USC 112, second paragraph. More particularly, the previous language, utilized language of "almost in contact with" in defining the relationship of the end face of the optical transmitter to a back surface of the plate or through-hole. While the Examiner considered such language to be indefinite, applicants submit that such language clearly describes the structural arrangement as illustrated in Fig. 9 of the drawings of this application, that the end face does not contact the back of the plate and there is a space between the end face of the optical transmitter and a back surface of the plate at the region of the through-hole. While the Examiner in paragraph 2 at page 2 of the office action states that "Further, Paragraph 83 clearly discloses that there is

no space between the through-hole 115B and the optical transmitter" (emphasis added), applicants submit that the Examiner's position is incorrect. More particularly, Paragraph [0083] (the paragraph bridging pages 17 and 18 of the specification) specifically discloses:

... Furthermore, the optical transmitter 141 is installed at the position almost in contact with the back of the through-hole 115b; therefore, there is no space between the through hole 115B and optical transmitter 141 which may allow abnormal discharge to occur. Thus, abnormal discharge does not occur in this position, either. (emphasis added).

Likewise, paragraph 75 (page 15, lines 9- 12 of the specification) provides that:

Numerous closely packed through-holes 115B are formed on the portion of the plate 115 corresponding to the measuring port 140 and optical transmitter 141 is installed almost in contact with the back of the plate 115 on the surface opposite to the plasma (P). (emphasis added).

Thus, the description in the specification and the illustration in Fig. 9 utilizes the language of "almost in contact with" as opposed to the language of "in contact with", to clearly set forth that there is a small spacing between the end of the optical transmitter 114 and the back surface of the through-hole in the plate 115. Moreover, paragraph [0083] clearly indicates that the spacing is sufficiently small so that abnormal discharge does not occur thereat. Accordingly, contrary to the position set forth by the Examiner, by the present amendment, the language as utilized in the specification, and previously considered indefinite by the Examiner, has again been utilized in the specification and applicants submit that such language is in compliance with 35 USC 112, first and second paragraphs. Again, applicants submit that such amendment does not raise new issues requiring further search and/or consideration by the Examiner.

Furthermore, by the present amendment, independent claims 24 and 30 have been amended to incorporate the features of dependent claim 32, for example

therein, by reciting the feature in claim 24 that the plate has a disk form conductor at a side of the plate which is out of contact with the plasma as represented by the plate 111 as previously recited in claims 32, 34 and 35 which have been canceled. Furthermore, as disclosed and illustrated, claim 24 has been amended to recite the feature that the through-hole is disposed in the area of the plate among a plurality of gas permeation holes 115A as illustrated in the drawings of this application, noting that claim 36 recites the feature that the plate having the through-hole has process gas supplied through the through-hole to the inside of the process chamber. Applicants note that claim 30 has been amended in a similar manner and applicants submit that independent claims 24 and 30, as amended, and the dependent claims recite features previously considered and clarified by the present amendment, so that the amendments do not raise new issues requiring further search and/or consideration.

The rejection of claims 30 - 35 under 35 USC 102(e) as being anticipated by or, in the alternative under 35 USC 103(a) as obvious of Grimbergen et al (US 6,390,019); the rejection of claims 24 - 25 and 30 - 35 under 35 USC 103(a) as being unpatentable over Grimbergen et al (US 6,390,019) in view of Moslehi (US 5,846,883); and the rejection of claims 24 - 26 and 29 - 37 under 35 USC 103(a) as being unpatentable over Grimbergen et al (US 6,390,019) in view of Moslehi (US 5,846,6883) and further in view of Wickramanayaka (US 6,333,601); such rejections are traversed insofar as they are applicable to the present claims and reconsideration and withdrawal of the rejections are respectfully requested.

At the outset, as to the requirements to support a rejection under 35 USC 102, reference is made to the decision of In re Robertson, 49 USPQ 2d 1949 (Fed. Cir. 1999), wherein the court pointed out that anticipation under 35 U.S.C. §102 requires

that each and every element as set forth in the claim is found, either expressly or inherently described in a single prior art reference. As noted by the court, if the prior art reference does not expressly set forth a particular element of the claim, that reference still may anticipate if the element is "inherent" in its disclosure. To establish inherency, the extrinsic evidence "must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill." Moreover, the court pointed out that inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient.

As to the requirements to support a rejection under 35 USC 103, reference is made to the decision of In re Fine, 5 USPQ 2d 1596 (Fed. Cir. 1988), wherein the court pointed out that the PTO has the burden under '103 to establish a prima facie case of obviousness and can satisfy this burden only by showing some objective teaching in the prior art or that knowledge generally available to one of ordinary skill in the art would lead that individual to combine the relevant teachings of the references. As noted by the court, whether a particular combination might be "obvious to try" is not a legitimate test of patentability and obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching or suggestion supporting the combination. As further noted by the court, one cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention.

Before discussing the inapplicability of the cited art, applicants submit that the presently claimed invention is based on the premise that a plasma processing

apparatus comprises (A) a plate constituting a ceiling of the process chamber inside of the vacuum vessel and held at an upper part of the vacuum vessel, and an optical transmitter mounted on the disk formed conductor inside of the vacuum vessel, and (B) an end face of the optical transmitter being opposite to a back surface of the through-hole in the plate and almost in contact with the back of the through-hole, wherein the optical transmitter receives at the end face thereof light from the process chamber via the through-hole.

Because the through-hole is disposed in the area of the plate among of a plurality of gas permeation holes, the processing conditions on the surface of the plate which covers this in the upper part of a sample to be processed are equalized even when the plate upper part side is equipped with optical transmitter. With this structure and the features of (A) above, the influence on surface side of a plate constituting a ceiling of the process chamber and facing to the plasma is reduced. Namely, the state of the surface of the plate constituting a ceiling of the process chamber and facing to the plasma has a big influence directly and relatively to the plasma and the sample processed by this plasma. Thus, in order to stabilize processing of the sample and to make it more uniform, the surface of the above-mentioned plate is called for that they are the same conditions in the range with the large surface of a sample which the plate covers. For example, it is called for that material or the form of the surface of the plate is the same as much as possible in the whole surface. When electric power of high frequency is applied to the plate via a disk formed conductor, since an interaction is greatly induced between the material of the surface of the plate and the particle in the plasma, the influence on processing of a sample caused by the state of the surface of the plate becomes serious.

The present invention is directed to solving a new problem caused by

arranging the means for detecting the light from the interior of a processing chamber with high precision. Namely, a material of the optical transmitter which facing to the plasma in the portion of the light detecting means is different from the material of the plate to which high frequency electric power is applied, and the interaction with plasma in the part facing to the plasma at the through-hole differs from the interaction at the surface of other parts. As a result, processing of the sample arranged below the plate may become uneven. According to the present invention, the optical transmitter is arranged to the upper part by the side of the back of the through-hole disposed in the plate, and the diameter of optical transmitter is smaller than the diameter of through-hole. Moreover, (C) a plurality of gas permeation holes are disposed in the area of the plate, and (D) an opening of the through-hole in the plate having smaller diameter than a diameter of the optical transmitter. With this structure, the processing conditions on the surface of the plate which covers this in the upper part of the sample to be processed are equalized even when the plate upper part side is equipped with optical transmitter.

In a structure where the optical transmitter and the back (upper surface) of the plate are contacted and joined to one another, the plate and the optical transmitter can be deal with as one member. However, feature of the plate or transmitter is in the state requiring exchange, both will be exchanged collectively. Especially, when the end face of the optical transmitter is exhausted or an adhesion problem arises on the surface of the end face of the transmitter, even if no trouble has arisen on the plate for processing, the optical transmitter is required to be exchanged with the plate. For this reason, the upper part of a vacuum vessel must be opened, work will take big time and the efficiency of processing will fall. On the other hand, even when it is considered to support the transmitter and plate separately, a problem may occur

on a deformation of the plate by receiving the heat during the processing of the sample. Namely, the problem is that because of the heat deformation of the plate, the surfaces of the plate and the optical transmitter which supported in a different part from the support part of the plate approach each other and become in contact, then, the power by deformation of the plate acts on these contacted parts, and finally, damage will arise on these contacted parts. Therefore, the optical transmitter is required to be supported in consideration of heat deformation of the plate. However, if a big gap is provided between both surfaces of the transmitter and plate, an abnormal electric discharge is likely to occur in the space of this gap. When unusual electric discharge is produced in this space, a problem of having a bad influence on processing of the sample arises. For this reason, the present invention provides feature (B) as above-mentioned. Thereby, the end face of the optical transmitter facing to the back surface of the plate is almost in contact with a back surface of the through-hole in the plate so that unusual electric discharge does not generate between the back of the plate and the optical transmitter. Further, damage by the mechanical collision between the plate and the optical transmitter is restrained, so that processing of the sample is detectable with high precision in a state where it was stabilized over the long period of time. Applicants submit that the aforementioned features are recited in independent claims 24 and 30 and the dependent claims and are not disclosed or taught in the cited art.

Turning to Grimbergen et al, this patent is directed to an arrangement which retrains adherence of a substance in a plasma to the surface of a transparent plate. Thus, Grimbergen et al provides a member which constitutes the ceiling of a processing chamber with a window 130 formed of a transparent plate 135 and an overlying mask 140, on the side of the plasma of the transparent plate, which may be

considered to form a part of an optical transmitter. The mask 140 is adhered to the transparent plate 135 and comprises a thick disk which covers all of the exposed portions of the transparent plate and has at least one aperture 145 extending therethrough. Thus, irrespective of the Examiner's contentions, Grimbergen et al does not disclose or teach features (A), (B), (C) and (D) as discussed above, and in particular, fails to provide any disclosure or teaching of the features recited in claims 24 and 30 that an optical transmitter is disposed inside of the vacuum vessel and almost in contact with a back surface of the upper plate so as to prevent abnormal discharge thereat, and that the upper plate has a disk formed conductor or member disposed at the upper side portion of the plate and on the plasma facing side of which the upper plate is disposed and that electric power for generating the plasma is applied to the upper plate via the disk formed conductor or member. Furthermore, as recognized by the Examiner, at page 5 of the office action, "Grimbergen et al do not disclose the optical transmitter detachable to the outside of the vacuum vessel" (emphasis added), which feature is recited in both independent claims 24 and 30. Thus, it is apparent that the rejection under 35 USC 102 is improper in relation to this feature alone.

Applicants further note that claim 24 recites the feature that the through-hole is disposed in the plate area among a plurality of gas permeation holes, which feature is also not disclosed or taught by Moslehi. Applicants submit that the Examiner cannot disregard the feature of claims 24 and 30 that an end face of the optical transmitter is disposed so as to be almost in contact with the back surface of the upper plate so as to prevent abnormal discharge thereat. Applicants submit that in Grimbergen et al, there is no disclosure of an upper plate which is applied with electric power via the disk formed member or disk formed conductor nor the other

features as recited in independent claims 24 and 30 and the dependent claims thereof. Accordingly, applicants submit that claims 24 and 30 and the dependent claims patentably distinguish over Grimbergen et al in the sense of 35 USC 102 or 35 USC 103 and all claims should be considered allowable thereover.

The Examiner recognizing that Grimbergen et al do not disclose the optical transmitter detachable to the outside of the vacuum vessel cites Moslehi as disclosing an optical transmitter of a longitudinal shape which could be detached from outside conveniently. Applicants submit that irrespective of the contentions by the Examiner, Moslehi only discloses in Fig. 22, a box labeled "full-wafer interferometry sensor 617", which is mounted on top of the optical plug 604 for real-time-in-situ monitoring and control of the plasma process uniformity on the substrate 607, as described in column 23, lines 38 - 46. As is apparent, the plug 604 corresponds to the plug 110 in Fig. 1 of Moslehi, such that the plug eliminates the provision of a through-hole in a plate, as defined in the claims of this application. Again, it is apparent that Moslehi does not overcome the deficiencies of Grimbergen et al as pointed out above, and the proposed combination represents a hindsight reconstruction attempt in complete disregard of the teachings of the individual references. Accordingly, applicants submit that independent claims 24 and 30 and the dependent claims patentably distinguish over this proposed combination of references in the sense of 35 USC 103 and should be considered allowable thereover.

Applicants note that dependent claim 31 recites a diameter-depth ratio of the through-hole and the upper plate is in a range of 5 to 100 noting that claim 30 recites the feature that an opening of a through-hole disposed in the upper plate has a smaller diameter than a diameter of the optical transmitter and the optical transmitter

receives at the end face thereof light from the process chamber via the through-hole. Such features are not disclosed or taught in the cited art.

With regard to the additional cited art of Wickramanayaka irrespective of whether or not this patent discloses a silicon or carbon plate, such patent does not disclose the structural arrangement as recited in claims 24 and 30 which features are not disclosed by Grimbergen et al and Moslehi taken alone or in any combination, such that Wickramanayaka does not overcome the deficiencies of the other cited art, as pointed out above. Accordingly, all claims patentably distinguish over the proposed combination of references in the sense of 35 USC 103, and should be considered allowable thereover.

In view of the above amendments and remarks, applicants submit that all claims present in this application should now be in condition for allowance and issuance of an action of a favorable nature is courteously solicited.

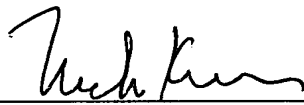
Applicants note that while applicants consider the amendment should place this application in condition for allowance, in view of the finality of the office action, in the event that the Examiner continues to reject the claims, applicants submit that this paper should be considered as a notice of appeal. Accordingly, applicants appeal the final rejection of the claims as set forth in the Office Action dated November 24, 2006, and authorize the charging of the notice of appeal fees to the deposit account indicated below. However, applicants request that the charging of the appeal fees be held in abeyance pending a determination of the action taken by the Examiner with regard to the present amendment.

Applicants are also submitting herewith an Information Disclosure Statement for the Examiner's consideration.

To the extent necessary, applicants petition for an extension of time under 37 CFR 1.136. Please charge any shortage in the fees due in connection with the filing of this paper, including extension of time fees, to the deposit account of Antonelli, Terry, Stout & Kraus, LLP, Deposit Account No. 01-2135 (Case: 520.39649CX3), and please credit any excess fees to such deposit account.

Respectfully submitted,

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